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Demystifying the Cul-de-sac Courtyards Syntax

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Abstract

Shah Alam has exhibited flourishing *cul-de-sac courtyard* neighbourhoods, which has stirred debatable interests. It is the objective of this paper to continue the discourse in measurable and technical analysis of *sub-classifications* or *syntax*. The paper assembles physical data with key characteristics that *make-up* the physical construct of a *cul-de-sac courtyard* by administering measurements, observations and checklists. The sub-classification processes led to preliminary key factors such as *density*, *size*, *design forms* and *user implications*. 18 *cul-de-sac courtyards* in Shah were catalogued and inventoried, elucidating its syntax. The database introduced potential in longitudinal research of the socio-spatial *micro-neighbourhood* unit, towards pragmatic applications in emergent design practices.

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1. Introduction

The creative, built-environment domain of Planners and Architects, typically faces numerous design typologies for residential planning. The design of neighbourhoods requires an infused and matured appreciation of the community within its own technical, social and cultural context. Developed nations, especially the United Kingdom, United States and Australia have amongst its housing developments, a historical and theoretical precedent of a category of residential planning of the *cul-de-sac*. However,

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beyond these nations, the design approaches and its implications to the very same category of residential planning, differ substantially and often lead to other classifications or *syntax*.

The notion of classifying these *culs-de-sac* neighbourhoods' syntax also suggests a micro understanding of each of the neighbourhoods. These *micro-neighbourhoods*, alludes to several aspects of commonality with each other but in essence also its individual, identifiable and measurable technical characteristics. This paper's aim is to extend this particular micro-neighbourhood research initiative within the context of *classification of the cul-de-sac courtyards*, in the Malaysian domain.

Relevant observations and international studies within the area of *culs-de-sac*, among others are of Asabere (1990), Charmes (2010), Cozens & Hillier (2008), and especially of Southworth & Ben-Joseph (1995, 1997) and Southworth & Owens (1993). Some of these international studies are remarkable within western planning and policies but requires a different, localised contribution within the Malaysian scenario.

As Malaysia intensifies its initiatives in providing housing to a burgeoning population, thoughts and research into other planning alternatives from that of the common 'terraces' have been debated upon especially in the provision of quality housing (Davis, et. al., 2006; Ghazali & Bajunid, 2011; and Othman & Said, 2012). This paper shall continue to offer further discussions, particularly to one specific investigation to the *cul-de-sac* courtyard neighbourhoods (Bajunid, et. al., 2012a, b, c, 2013). The limitations of this paper however, comprises of limited *local* literature on the subject matter (micro neighbourhoods) academically, compared to that available in practice.

In essence, this paper's objective shall endeavor to elucidate the *classification processes of the cul-de-sac, within the scope of the Malaysian, Shah Alam City Council (SACC) district*. The paper aspires at reporting the various *sub-classifications* available within the context of the Malaysian *cul-de-sac* courtyard neighbourhoods.

The first segment of the paper shall present a systematic and adapted meta-analysis at amassing available literature of the *culs-de-sac*. The second segment shall discuss the classification method that was employed based on the literature reviewed, whilst the third segment rationalise the classifications and implies the way forward.

2. Literature mining

2.1. Literature search

The principles of the Boolean logic were undertaken to search for specific keywords of literatures in the digital construct. Bajunid, et. al. (2012a) explores this in detail digitally and resourcefully. He explored the search with great enthusiasm but within the confines of a specific time span, as the worldwide web of academic literature continues to expand exponentially.

2.2. Relevant literature extraction

Bajunid, et. al. (2012a, b, 2013) has also covered the breath of the literature sourcing to the immediate relevancy of the *Malaysian context* through an adapted a series of *systematic reviews* in his papers. It must be noted that this too, are limited by the time frame that the investigation was undertaken as digital mediums constantly evolves and expands. However, he did note that there was a continuous and *systemised field of digital alerts* to organize new and current data.

2.3. Multi-disciplinary

Within the realm of environment-behaviour, it could be assumed that the field traverses several academic domains, and this was justifiably so as the literature search demonstrated. The plurality of the *neighbourhood* sphere signifies the complexity and nature of the research. The trans-disciplinary research infers multiple future research potentials but requires stringent structure and control. This paper continues the works of Bajunid (2012b) of specific assessment method of *identifying* the cul-de-sac courtyards to *classifying* the neighbourhoods within the Shah Alam City Council. *Figure 1* attempts to describe visually a portion of journal domains, with current authors that are engaged in research within the peripheral arena of the *cul-de-sac and its neighbourhood*.

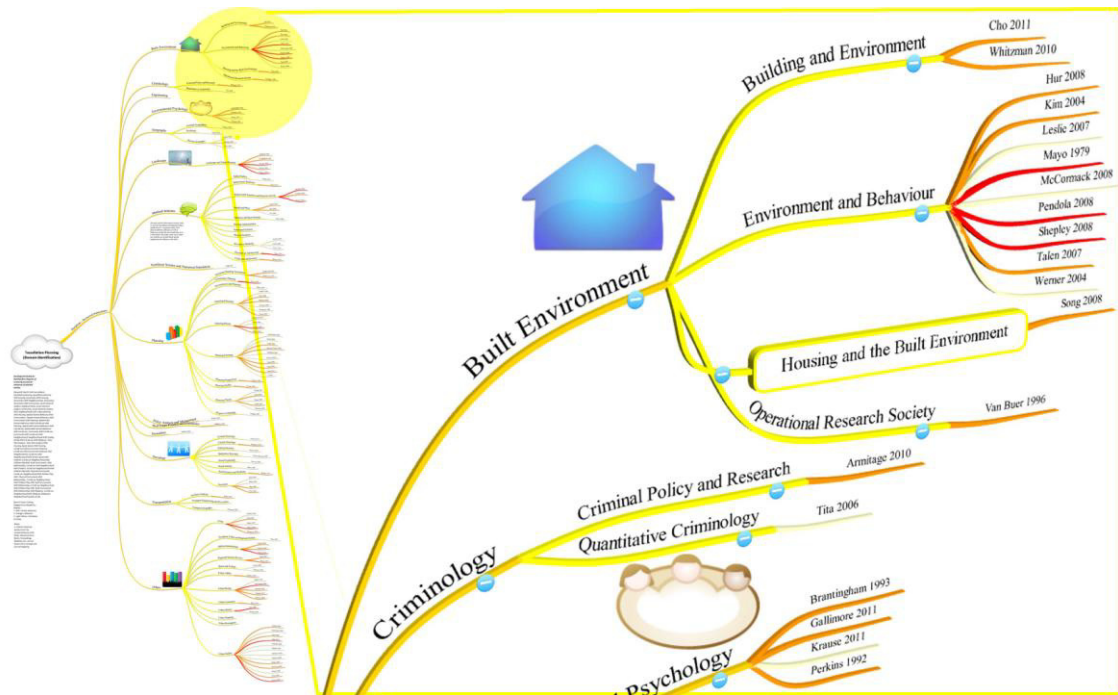


Fig. 1. *Mind-mapping of Journal categorisation* (illustration shown are only subsamples), (Author, 2011), based on the Boolean logic and inclusion criteria of 74 databases and 23 academic domains (Bajunid, et. al. 2012a). The illustration denotes mapping during the period the paper was written. For a complete and detail description on the visuals, please contact the Author.

The trans-disciplinary nature of the cul-de-sac expands over 15 domains (Bajunid, et. al., 2012a). Some areas are ambiguous, but there is a pattern that has taken form, as illustrated in *Figure 2*. Themes of these *macro-* and *micro-* neighbourhood issues have been addressed by Bajunid, et. al., (2013).

3. Discussions on classification of the cul-de-sac

3.1. Expanding archives

The literature search on the assessment methodology of identification and *classification* assembled a generous 38 literatures, potentially appropriate for review. However, only 17 were deemed useful by outcome, after the exclusion of literatures that did not relate to direct methodology. These embodied

literatures were from various academic publications and a specific PhD research on the cul-de-sac courtyard. *Table 1* illustrates the sieving processes and relevancy of the assessment methodology of cul-de-sac. This illustration only intends to capture the breadth of available research, whilst maintaining focus on the local scene. It is evident that the local domain has yet to build its own published material on this discussion. In spite of this, the physical construct of the cul-de-sac courtyard neighbourhoods has been in existent for almost forty years, as in the case of Shah Alam municipality.

It must be noted also that *Table 1* does not reflect the entirety of unpublished sources. A number of these unpublished materials and other sources have been tabled in detailed by Bajunid, et. al., (2012b). Yet, even then, the processes of *classification* remain obscure and subjective.

This subjectivity is arguably uncommon as it represents inherent traits of the planning and architectural profession. The visual language or pedagogy justifies a common interpretation of the built environment, not immediately apparent to the mere nonprofessional of the built environment discipline. What seems to be a complex *plan* to the nonprofessional seems obvious to the trained architect or planner due to the *visual language*. However, not all these subjectivity are all *subjective*. There is a certain underlining coherency of hierarchy, structure, and technicality behind the esthetics. The cognitive pedagogy of the architectural and planning profession is not the focus of this paper but underlines the next segment of the discussion.

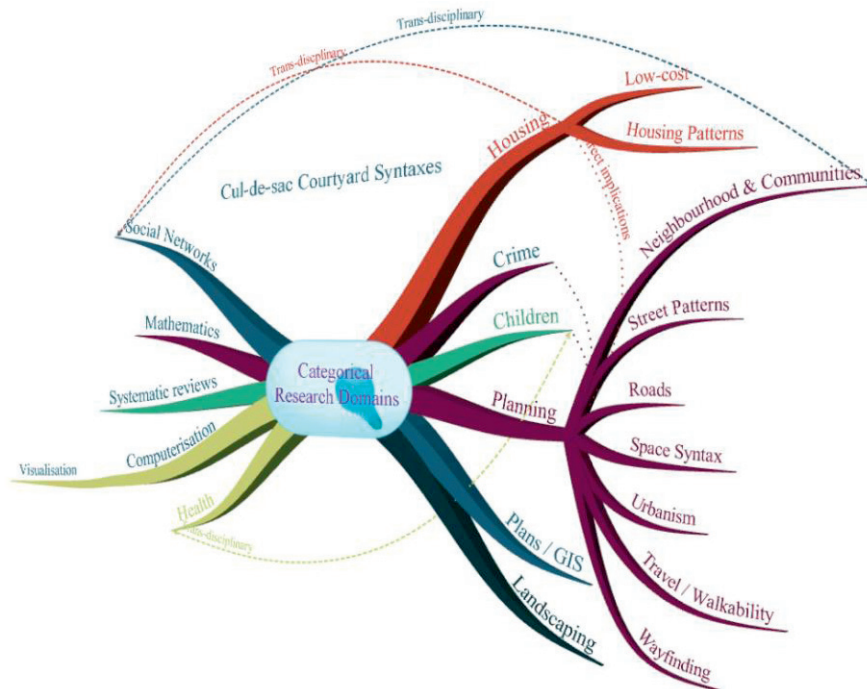


Fig. 2. *Mapping the Trans-disciplinary Domains of the Culs-de-sac* (Author, 2012). The figure (subsample) above represents published materials of the cul-de-sac and the environment-behaviour within categories of major issues of the macro and micro neighbourhood (current trans-disciplinary mapping at the time this paper was written). For a complete and detail description on the visuals, please contact the Author.

Table 1. *Literature Sieving Processes* by Bajunid, et.al. (2012a, b, 2013), reviewed for identification and *classification* processes of the cul-de-sac. The percentages (%) are only indicative of available and relevant extracted data in each stage of the filtering processes.

Progressive Hits on Literature Sourcing (n)									
Screening Processes / Search Publication Milestones	General Search		Potential Relevant Studies		Potential Abstracts		Potential Appropriate Studies		Usable Studies
	Overall search	Context Specific	Potentially relevant studies identified and screen for retrieval.	Ineligible studies excluded as it is not within the research scope; i.e. non-human, non-built environment, on the basis of the title.	Abstracts of studies retrieved.	Studies excluded if it is not an assessment or methodology.	Potentially appropriate studies for review. Evaluated studies for methodology to determine relevance to inclusion criteria.	Studies excluded from review if results did not relate to 'assessment' or methodology.	Studies with usable information by outcome.
(Bajunid, et al., 2012a)	Physical environment + neighbourhood + cul-de-sac + Malaysia								
	4,000,000		3,560	3,377	183 (5.14%)	68	115 (3.23%)	46	n = 69 (1.93%)
(Bajunid, et al., 2013)	Cul-de-sac + neighbourhood + social cohesion								
	650,000	19,770	3,870 (19.57%)	3,167	703 (18.16%)	662	41 (1.05%)	23	n = 18 (0.46%)
(Bajunid, et al., 2012b)	Assessment methodology + cul-de-sac + neighbourhoods								
	604,000	50,600	5,230 (10.33%)	4,575	655 (12.52%)	617	38 (0.72%)	21	n = 17 (0.32%)

4. Findings: From identification towards classification

4.1. Identification of the cul-de-sac courtyards

The previous study of Bajunid et. al. (2012b) initiated the identification processes of a cul-de-sac within the municipality, based on these literature reviews. This was also made possible by the various maps of different scales obtained by the authors, digitally as well as manually via the local authority. The same author also met with relevant personnel in the local authority to substantiate the same process and findings within the local context of the SACC district (using reviews by Bajunid 2012b). This was done through a number of face-to-face meetings and correspondences.

In summary, the numerous discussions were quite disconcerting in the availability of relevant data of *street and segment* analysis (Bajunid, et. al., 2013) within the local scene. To expect *classification*, is even more inane as was used by other international research (Bajunid, 2012b). Upon retrospective, it was clear that within the local scenario, establishing any tangible data of the micro neighbourhood, (or even the cul-de-sac courtyard) would be greatly novel (Table 2). This was highly supported by the positive reactions and support garnered for the continuation of the research endeavour by the various authoritative personnel that were interviewed. There were however some sort of peripheral local documents that provided a sense that the authorities were also heading towards that shared direction with indications of the cul-de-sac as the preferred design in neighbourhood planning (Federal Department of Town and Country Planning, 2011; Selangor Department of Town and Country Planning, 2010).

The following finding, within the typical design terminology of the cul-de-sac courtyard, refers to the naturally formed courtyard within the cul-de-sac layout, with only one point of entry and exit. Efforts have been initiated in keeping pace with new classification methods, yet, the context specific and

delimitations of the cul-de-sac courtyards shall be in the manual and digital identification of the following study. The site observation approach along with available data stipulated earlier shall delimit the scope and findings towards future triangulation purposes.

Table 2. *Identification Sieving Processes*. Extracted from Bajunid, et. al. (2012b), illustrates the detailed sieving processes in identifying the cul-de-sac courtyards within the SACC jurisdiction, which consists of an estimated ± 3180 street segments in 2011. - *Explanatory Notes:-* Process No:- (7) MBSA Total Jurisdiction – 290.3km² (71,734.42 acres) with 56 Seksyen. Percentage reflects estimated neighbourhoods to the total number of Seksyen. A more detailed identification, grid by grid, could be obtained through the Author. Cul-de-sac percentages are based on Panduan Jalan Bandaraya Shah Alam (Indeks Jalan 56 Seksyen – 1-36, U1-U20) [Pemetaan Negara Malaysia, JUPEM.BP.PP.24.04.1.jld.60/58]. For a complete and detail description on the visuals, please contact the Author.

Macro and Micro Identification Sieving			
No	Processes	Map 4 (Sieve 3)	Map 4 (Sieve 4)
1	Type of Map	Google Earth & Google Maps	On-site Assessment
2	Source & Date	Google (Imagery Date - 23 January 2010, Retrieved between 27-29 September 2011)	Assessment conducted between September 2011 – June 2012
3	Scale	Eye Altitude 2000 to 441m	On-Site Assessment
4	Methodology Sequencing	Manual and Digital Micro Identification	
5	Criteria	<p>Cul-de-sac 1 point of Entry 500 m² – 4000 m² 20 - 80 terrace houses</p> <p>Green / Courtyards Visible</p>	
6	Nos of Neighbourhoods (Street Type) Identified	9 Neighbourhoods (47 Patterns)	5 Neighbourhoods (18 Culs-de-sac)
7	Relevant Neighbourhoods (%) / Street in MBSA	< 16.0% (1.41%)	< 8.93% (0.50%)
8	Further Assessment Required	Yes	No
9	Neighbourhoods Identified	<p>Seksyen 11</p> <p>Seksyen 18</p> <p>Seksyen 28 – Alam Indah</p> <p>Seksyen 31 – Kota Kemuning</p> <p>Seksyen 35 – Alam Impian (2)</p> <p>Seksyen 35 – Desa Kemuning</p> <p>Seksyen U8 – Bukit Jelutong (2)</p>	<p>Seksyen 8 (8/1C, 8/1D)</p> <p>Seksyen 11 (11/8B)</p> <p>Seksyen 18 (18/5A, 18/14A)</p> <p>Seksyen U8 (U8/74C, U8/95A, U8/95D)</p> <p>Seksyen U8 (U8/95E, U8/95F, U8/96B)</p> <p>Seksyen U8 (U8/48D)</p> <p>Seksyen 35 (35/2B, 35/4B, 35/4A, 35/3B)</p> <p>Seksyen 35 (35/121, 35/119)</p>
10	Notes	Visual assessment acknowledges Maps' Validity and Verify Current Status of Neighbourhoods.	

4.2. Classifying the cul-de-sac courtyards

4.2.1. The method of inventory and categorising

In order to ascertain first that the actual cul-de-sac courtyard exists as seen by visual legibility in the digital and street maps, a physical visit was conducted to verify its location (Bajunid, et.al). This manual and physical method continued in the full assessment of all cul-de-sac courtyards in Shah Alam by three trained architects. In ensuring its validity amongst the architects, separate visits were also conducted separately and then discussed confirming its verdict. This continuous process of multiple site visits occurred between September 2011 to June 2012.

Subsequently, each cul-de-sac courtyard was photographed and catalogued visually and technically. As seen in two samples of a cul-de-sac courtyard in Figure 3, each of the 18 courtyards was documented visually. This documentation process is detailed further in Table 4, but the sequence of this process could

be clearly described (within the context of architectural pedagogy) as *Site Analysis*. Although the very notion of site analysis could be highly debatable in its different approaches, the fundamental essence and hierarchy was captured and shown in *Table 4*.



Fig. 3. *Technical Visual Analysis* of Seksyen 18/5A, 14A and U8/74C, exemplifying the stark contrast of varying cul-de-sac courtyard arrangements and typology (Author, 28 September 2011). *Top right*: Google Earth from 509m Eye Altitude of Seksyen 18. *Top cul-de-sac* – 18/14A, *bottom cul-de-sac* – 18/5A with corresponding panoramas. *Bottom Right*: Google Earth from 521m Eye Altitude of Seksyen U8/74C (Bukit Jelutong), with panoramic street approaches into the cul-de-sac courtyard (left) (4th October 2011).

4.2.2. Illustrating, recording and decoding

It was also important to decipher these courtyards into technical terms. Each of the 18 cul-de-sac courtyards was interpreted and digitised via AutoCAD, a highly, technical software used by local and international conglomerates across the construction's various consultants. The software is a precise tool often used for specification and tendering of drawings. Due to the various limitations of different developers involved throughout the 35-year span of the 18 different culs-de-sac; the cul-de-sac courtyards were digitally overlapped and redrawn with triangulations of on-site surveys in ascertaining its measurements. With the industries standards and Uniform Building By-Law (UBBL), certain technical aspects of the layout could also be confirmed visually as well as technically. Though the internal area or footprint consistency of each of the houses could be disputed, this research only aims at discovering the external spaces or 'courtyard' within the cul-de-sac. It is important to highlight, as learnt by Bajunid, et.

al. (2012a), that these *in between spaces* are often unnoticed, but vital within the micro neighbourhood setting.

Apart from the accuracy of the technical drawings, colour coding was implemented in determining and streamlining the various important *land uses* of each cul-de-sac courtyard neighbourhood (*Figure 4*). This digital re-identification and differentiating degree and intensity of the colouring simplifies and exhibits the necessary utility of each of these elements. Successively, after conceiving all the manual and digital technical settings, the cul-de-sac courtyards were personally visited and observed to ensure its absolute validity again.



Fig. 4. *Processes of Classifying a Cul-de-sac Courtyard*, (Author, July 2012). *Top*: Panorama of Neighbourhood 5 (Seksyen U8/95D). *Bottom Left*: Google Earth from 516m Eye. *Bottom Right*: Technical drawing with colour coding after inserting all necessary documents and observations on site.

4.3. Summarising the findings

The process of the meticulous, digital documentation is repeated to all sites. Each of the 18 cul-de-sac courtyards has to be treated individually, to ascertain its objectivity. To this end, an apparent table consisting of various items or *characteristics* could be formed. The similarities and dissimilarities of the *inherent characteristics* of these culs-de-sac could be better grasped and appreciated.

Table 4 illustrates all the 18 different cul-de-sac courtyards within one comprehensive technical evaluation. A technical evaluation of this sort is typically termed as an *audit*, within common practice of an architectural consultancy. More so *design oriented* than theoretical, it does draw in several conjectures of academic and social importance. The technical findings are non-speculative as tabled, but the inferences on the social fabric of the micro neighbourhood are unfathomable, and require further research.

In general, development of the *items* and *characteristics* was almost mechanical and rather instantaneous. This would be justifiable, as though the layout may seem *designed*; there are similarities in realising such a construction technique. The conventions of housing and terraces remain historically the same, with manageable, subtle detailing in adhering to different typologies and concept.

The cul-de-sac courtyard layout mainly consists of an additional characteristic, the *courtyard*, surrounded by a limited number of housing units, with a single vehicular entrance. This one aspect could further be tabulated and calculated in detail by dividing the items into two main categories of *technical and social characteristics*. New Urbanism and Suburbia with its criticisms of cul-de-sac underlines this particular planning typology. It is anticipated this research paper will contribute to that debate, from a non-western perspective.

Within the technical characteristics, it could then be divided into *general* and *specific* cul-de-sac oriented attributes; such as development maturity, coordinates, courtyard sizes and area, specification of street and pavement, housing typology and number of units.

The social characteristic embodies two further aspects of the larger *population implications* and immediate *user implications*; such as density, affordability, community integration, privacy, accessibility, permeability and street pattern.

The sub-characteristics of both these technical and social characteristics further numerates *syntax* of interesting questions for further research. It is within these components that a certain pattern and trend has begun to emerge as described by Bajunid, et. al. (2013). *Table 4* has merely indicated its descriptive analysis as in degrees of colour coding, in measures of highest quantity or strengths within the 18 culs-de-sac. Further analysis needs to be conducted to extend the meaning to these findings. This is to ensure as in all environment-behaviour studies, that the findings are not conveniently generalised to all cul-de-sac courtyard neighbourhoods. However, it can be surmised that for the SACC district, these components represents sufficient classification characteristics.

5. Conclusion

The processes described in the paper were technically explicit in the classification of the cul-de-sac courtyards within Shah Alam City Council district. It is uncertain that the described processes could be applied to other districts, but the analysis is encouraging. It must be noted as well that many other municipalities do not have sufficient data compared to that of the Shah Alam municipality. Research of similar endeavours, are advised to consider the need of large resources in handling the various limitations and delimitations.

It is hoped that the objective of this paper in elucidating the various technical complexities of the cul-de-sac courtyard (environment-behaviour research), first pave way by systematically identifying the characteristics that make-up the built environment. The technical methodology introduced to quantify systematically a cul-de-sac neighbourhood can be applied to various forms and layouts. An extension of this even poses possibilities of linear type neighbourhood assessment. As long as the inherent characteristics remain constant amongst the neighbourhoods, a similar conclusion of its behaviour (occupant) can be attempted.

Architects, planners, designers would be better equipped in their practical expertise of designing, not only to adhere to their professions' requirements, but also to keep the focus of the end-users (residents) whom shall devote their livelihood to that one neighbourhood for their entire lives.

Table 3. *Cul-de-sac Courtyard Syntax of Shah Alam City Council (Author, June 2013)*. Explanatory Notes on item sources:- (1,2,10) JPBD Selangor, MBSA & Site Visual Analysis; (3) iPhone 4 AGPS Photo Metadata cross-referenced with Google Earth & ViewNX 2 Ver.2.0.3; (4,9) Site Visual Analysis between three experienced architects; (5,8b-d, 9c) Estimations via Google Earth & AutoCAD

For a complete and detail description on the visuals, please contact the Author.

[illegible]

The availability of such designs in Malaysia is mainly limited to cities and townships at the medium density of suburban fringes. These criteria shall be the basis for scaling the research to state and national level. This analysis was able to show some form of *classification* in the different technical and social characteristics. This shall be able to relate further to environmental psychology and the social dynamics of homeowners that resides within each of this particular variety of a cul-de-sac courtyard. This area of research will require trans-disciplinary collaboration of different fields in comprehending the different *syntax* of the cul-de-sac and how they affect neighbourhoods. These studies could then better assist policy makers, planners and architects to engage in the design of neighbourhoods in a more holistic approach.

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